CLAIMS

We claim:

1. A structure for the construction of one of a microscale and nanoscale device, comprising:

   a rigid frame supporting a diaphragm comprising a first material, the diaphragm having an opening therethrough,

   a region of a second material disposed in the opening and supported by the diaphragm.

2. A structure as recited in claim 1, wherein the diaphragm comprises a layer of silicon nitride.

3. A structure as recited in claim 1, wherein the second material comprises one of polyimides, photoresists, Parylene®, organic molecules, inorganic molecules, metals, and insulators.

4. A structure as recited in claim 1, wherein the second material comprises polyimide.

5. A structure as recited in claim 1, wherein the nanoscale device is a nanopore.

6. A structure as recited in claim 2, wherein the silicon nitride layer is from 100 nm to 300 nm in thickness.

7. A structure as recited in claim 5, wherein the silicon nitride layer is about 200 nm thick.

8. A structure as recited in claim 1, wherein the width of the diaphragm is about 40 micrometers.

9. A structure as recited in claim 1, wherein the diaphragm is in tension.

10. A structure as recited in claim 1, wherein the opening has a diameter of about 5 micrometers.

11. A method of making a structure for the construction of one of a microscale and nanoscale device, comprising:
    (a) providing a diaphragm supported on a rigid frame, wherein the diaphragm has an upper layer of an upper material and a lower layer of a lower material,
    (b) defining a region to be etched on top of the diaphragm,
    (c) etching away a region of the upper material to expose a region of the lower material,
    (d) depositing a layer of an insert material on the upper material and on the exposed region of the lower material, and
    (e) etching away the lower material from the lower surface of the diaphragm to expose a lower surface of the insert material.

12. A method as recited in claim 11, wherein the insert material is defined to occupy a limited region.

13. A method as recited in claim 11, wherein photolithography is used to define the region to be etched.

14. A method as recited in claim 11, wherein plasma etching is used to etch away the region of the upper material.

15. A method as recited in claim 11, wherein the insert material comprises material chosen from the group comprising polyimides, photoresists, Parylene®, organic molecules, inorganic molecules, metals, and insulators.

16. A method as recited in claim 11, wherein the insert material comprises polyimide.

17. A method as recited in claim 11, wherein the insert material is formed by methods chosen from spincasting, sputtering, evaporation, UV polymerization, thermal polymerization, catalyzed polymerization, low-pressure polymerization, chemical vapor deposition, ion beam deposition, plasma deposition, atomic layer deposition, vacuum self-assembly, low-pressure self-assembly, and aqueous self-assembly.

18. A method as recited in claim 11, wherein the insert material is formed by spincasting and thermal polymerization.

19. A method as recited in claim 11, further comprising fabricating a nanopore through the insert material.

20. A method as recited in claim 11, wherein the rigid frame is formed by techniques chosen from bulk micromachining and surface micromachining.